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GEOPHYSICAL ABSTRACTS

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BY

FREDERICK W. LEE

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GEOPHYSICAL ABSTRACTS[1]

No. 41

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

(967) TERRAIN AND TOPOGRAPHICAL EFFECTS IN GRAVIMETRIC SURVEYS

By W. G. G. Cooper

The Mining Magazine, London, vol. 46, No. 5, 1932, pp. 282-285.

In this article the author suggests a method of computing terrain and topographical effects in survey work with the Eötvös torsion balance. The suggestion embodies the use of slide rule, graphical work, and planimeter, and it is claimed that the accuracy of these instruments is equal to or greater than that of the assumptions made regarding density of material, etc. Levels are taken along radial lines (8 in normal country) at any convenient distances, giving a fair representation of the ground.

The theory of the method is discussed.--W. Ayvazoglou.

(968) SURVEYS WITH THE TORSION BALANCE AND THE MAGNETOMETER IN EASTERN CANADA

By A. H. Miller

The Journal of the Royal Astronomical Society of Canada, Toronto, vol. 26, No. 1, 1932, pp. 1-16.

The author discusses the results of the torsion balance and magnetometer surveys carried out in Ontario over the Hull-Gloucester fault at Leitrim, the Hazeldean fault, the Caldwell pyrite deposit, and the dunite intrusive at Thetford, Quebec.

The results are represented in a series of plans and diagrams.--W. Ayvazoglou.

(969) TEKTONISCHE UND GEOPHYSIKALISCHE PHÄNOMÄNE IN DER FERGHANREGION, ZENTRALASIEN

(TECTONIC AND GEOPHYSICAL PHENOMENA IN THE REGION OF FERGHANA, CENTRAL ASIA)

By Franz Kossmat

Zeitschrift der Deutschen Geologischen Gesellschaft, Berlin, vol. 84, No. 2, 1932, pp. 84-94.

Geophysical phenomena in the region of Ferghana are discussed in Chapter IV of this article. The region is characterized by great negative gravity anomalies. A few especially typical values are given in a table. --W. Ayvazoglou.

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(970) LA PROSPECTION GRAVIMETRIQUE DANS LES REGIONS PETROLIFÈRES

(GRAVIMETRICAL PROSPECTING IN THE OIL-BEARING REGIONS)

Editorial note

Le Génie Civil, Paris, vol. 100, No. 14, 1932, p. 355.

The note relates to the papers presented by Gornich and Reich during the general meeting of the German Geological Society, held from September 14 to 17, 1931 (see Geophys. Abs. 34, p. 372).--W. Ayvazoglou.

2. MAGNETIC METHODS

(971) AN IMPROVED METHOD FOR THE COMPARISON OF SMALL MAGNETIC SUSCEPTIBILITIES

By R. A. Fereday

Proceeding of the Physical Society, London, vol. 43, part 4, No. 239, 1931, pp. 383-393.

In an earlier communication (Proc. Phys. Soc., vol. 42, 1930, p. 251) an account was given of a new method, of the nonuniform field type, for the comparison of small magnetic susceptibilities.

In this article the author continues his investigations and shows that a magnetic field, especially suitable for determination of relative susceptibility by an improved nonuniform field method, can be produced by an electromagnet whose pole pieces are respectively plane and spherically concave.- W. Ayvazoglou.

(972) THE MAGNETOMETER IN ILLINOIS

By Perry S. McClure

Transactions of the Illinois State Academy of Science, Springfield, vol. 24, No. 2, 1931, pp. 341-349.

A description is given of magnetometer surveys carried out in Eastern Illinois where the geologic structure is well known. The entire survey covers an area of 3,240 square miles. Some 1,620 magnetometer stations were established in these areas to measure the relative vertical magnetic intensity.

This report points out some of the principal anomalies of the earth's magnetic field in Illinois as revealed by measurement of the vertical component at numerous points and describes the effect of faults on the vertical magnetic intensity.

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A discussion under the following headings is given: (1) Earth's magnetic field, (2) history of magnetic exploration, (3) magnetic field balance, (4) interpretation of magnetic anomalies, (5) magnetic anomalies in Illinois, and (6) tracing faults with the magnetometer.

The author concludes that the magnetometer has two principal uses in Illinois. First, in regional reconnaissance surveys it is quite possible to pick up structural trends, and second, in doing detailed work it will indicate the position of faults.

(973) CATALOGUE OF MAGNETIC DETERMINATIONS IN THE U.S.S.R. AND IN ADJACENT COUNTRIES FROM 1556 TO 1926

By B. P. Weinberg

Issued by the Central Geophysical Observatory in Leningrad, 1932, pp. 216-297.

This is the second part of the catalogue issued by the Central Geophysical Observatory in Leningrad (see Geophys. Abs. 11).

The catalogue is supplemented by three charts reduced to the epoch 1925:

1. Chart of isogamic lines.
2. Chart of isoclinal lines.
3. Chart of isodynamic lines.

Explanations to the charts are given in the Russian and English languages.--W. Ayvazoglou.

(974) PRELIMINARY SUMMARY OF DATA ON THE PRESENT DISTRIBUTION OF MAGNETIC DECLINATION WITHIN THE ARCTIC ZONE

By Boris P. Weinberg

Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 36, No. 4, 1931, pp. 273-278.

Owing to the fact that the determinations of the magnetic elements in the arctic regions are irregularly distributed over the territory, as well as in time, so that it is difficult to find their distribution for a definite epoch in a sufficiently trustworthy manner, the author tries to solve this problem by using the method of successive approximations relating to an element ϵ and to its secular variation (annual change) ϵ'.

The method summarized in this article has been developed as the results of Weinberg's experience in reducing to 1925 all the magnetic determinations in the U.S.S.R. and adjacent countries. Data on the distribution of magnetic declination within the arctic zone is summarized in figures and a table.--W. Ayvazoglou.

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(975) TERRESTRIAL-MAGNETIC ACTIVITY AND ITS RELATION TO SOLAR PHENOMENA

By J. Bartels

Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 37, No. 1, March, 1932, pp. 1-52.

A homogeneous series of monthly means of terrestrial-magnetic activity for the years 1872 to 1930 is derived and extended backward, in annual means, to 1835. The annual variation of magnetic activity and of the relative sun-spot numbers is discussed by means of new tests for periods. Only the semi-annual wave in magnetic activity is recognized as physically significant. Its maxima prefer the times when the sun is in the celestial equator, and not, as has been suggested, the times when the sun's axis is most inclined toward the ecliptic. This view is supported by tests using the harmonic dial and the probable-error circle, and by several independent considerations.

The close relations between sun-spot numbers and terrestrial-magnetic activity in the annual and monthly means are discussed. Some general statistical aspects are given for the treatment of the correlation between such series with after effects, for which both solar activity and terrestrial-magnetic activity are typical. The homogeneity of the whole available series for relative sun-spot numbers and for areas of sun-spots and faculae is tested; some inhomogeneities are found, apart from a general lag of terrestrial-magnetic activity that has occurred in some sun-spot-cycles. A break in the homogeneity of the international magnetic character figures in recent years is discovered.

The individual 27-day recurrences in terrestrial-magnetic activity during 1906-1931, and their relations to solar activity are discussed with the help of a graphical day-by-day record. They indicate the existence of persistent activity areas on the sun's surface, called M regions, which, in many cases, can not be coordinated to such solar phenomena as are observable by direct astrophysical methods. This holds in particular for the new solar indices which are available for the years 1928-1930, and which are found so closely correlated to sun-spot numbers, that they fail to improve the correlation between solar activity and terrestrial-magnetic activity. Observations of terrestrial-magnetic activity yield therefore not only information about geophysical influences of such solar phenomena that may be traced in astrophysical observations, but supplement these direct observations themselves--Author's abstract.

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(976) ZAMERENI A VYPOCET MAGNETICKE DEKLINACE (IN BOHEMIAN)

(OBSERVATION AND CALCULATION OF MAGNETIC DECLINATION)

By Fr. Cechura

Hornicky Vestnik (Mining Journal), Prague, 1931, pp. 1-18.

After a brief introduction in which the author indicates the practical importance of knowing the correct magnetic declination, a description of the Schmidt and Neumayer mirror-declinometer and of Hildebrand's magnetic theodolite is given.

The process of measurements is discussed. Checking of the results in order to avoid errors in calculations is explained.--W. Ayvazoglou.

(977) A TYPICAL CASE OF VARIABILITY OF QUIET-DAY DIURNAL VARIATION IN TERRESTRIAL MAGNETISM AND EARTH CURRENTS AT WATHEROO

By J. Bartels and W. J. Rooney

Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 37, No. 1, March, 1932, pp. 53-55.

The small magnetic diurnal variation recorded at the Watherloo Observatory, Watheroo, Western Australia, on two successive magnetically very quiet days, February 3 and 4, 1929, was noteworthy. This case is discussed as typical for the variability of the quiet-day diurnal variation. A significant parallelism is found with the diurnal variation of earth currents.--Authors' abstract.

(978) TEST-DEFLECTIONS FOR VARIOMETERS AND MAGNETOGRAPHS

By George Hartnell

Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 37, No. 1, March, 1932, pp. 63-78.

This is the continuation of the article published under the same title in "Terrestrial Magnetism and Atmospheric Electricity, vol. 36, No. 4, 1931, pp. 279-296. Author's abstract of the article is given in Geophysical Abstracts 37, May, 1932, p. 442.--W. Ayvazoglou.

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(979) THE AGINCOURT SCHUSTER-SMITH COIL-MAGNETOMETER

By W. E. W. Jackson

Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 37, No. 1, March, 1932, pp. 79-82.

In this article the author describes the function of a Schuster-Smith coil-magnetometer installed in August, 1931, in the magnetic observatory at Agincourt.

The principle of the instrument is given briefly.

A table shows the results of observations made on August 12, 1931, and the results of comparison with the magnetograph, the values of which are deduced from observations with Elliott magnetometer No. 98 reduced to the International Magnetic Standard of the Department of Terrestrial Magnetism of the Carnegie Institution.--W. Ayvazoglou.

(980) MAGNETIC CONVERGENCE MAPPING

By W. I. Ingham

The Mines Magazine, Golden, Colorado, vol. 22, No. 7, 1932, pp. 7-8.

This paper deals with a method of mapping and interpretation used by the writer in some areas in Texas, while making magnetic surveys with the Schmidt vertical-intensity magnetometer.

Preparation of the magnetic convergence maps is explained.--W. Ayvazoglou.

(981) THEORY AND EXPERIMENTS CONCERNING A NEW COMPENSATED MAGNETOMETER SYSTEM

By C. A. Heiland and W. E. Pugh

The American Institute of Mining and Metallurgical Engineers, Technical Publication 483, 1932, 42 pp.

Heiland's summary of the paper reads as follows:

> The angle of deflection in magnetic-intensity variometers indicates a balance between the magnetic force component to be measured and another known force, which is either (1) of a magnetic or (2) of a mechanical nature (torsion of wires, gravity moment). Only in the first case can the influence of temperature be avoided, as the temperature coefficient of the needle cancels; in the second case, a compensation for temperature is possible, as its magnetic effect can be partly neutralized by an opposing "mechanical" effect. Although the magnetic effect is usually reduced as much as possible by using

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systems of great moment, as a rule it remains greater than the mechanical effect. Then additional compensation is required, which may be of a magnetic (auxiliary magnet) or of a mechanical nature (temperature affecting torsion of suspensions or the position of the center of gravity, etc.) In vertical magnetometers, the last type of compensation is used mostly. In the old type of Schmidt balance it was accomplished by shifting the blades; in the new system, by suitably arranged temperature and latitude spindles.

The theory of the temperature effect on a magnetic system is given in two parts. First, the magnetic temperature coefficient only is considered, in its effect on scale value and reading. The magnetic T.C. of the scale value is negligible ($=\mu\varepsilon$), μ being the temperature coefficient of the magnetic moment. The magnetic T.C. of the reading is very large (T.C. = $-\mu Z$), proving that the T.C. depends on the latitude.

Second, the combined "mechanical" and "magnetic" effects are discussed. For the T.C. of the scale value: T.C. = $(\delta+\mu)\,\varepsilon$, δ being the expansion coefficient of steel, the T.C. of the scale value is again negligible. For the temperature coefficient of the reading, T.C. = $-Z_o\,(p+\mu)$, Z_o being the vertical intensity for which the system is adjusted, p representing the "mechanical" temperature coefficient; it may be made negative and equal to μ by a suitable arrangement of the masses in the system.

There is an influence of latitude upon a compensated system, as Zp remains practically constant, but $-Z\mu$ changes. The temperature coefficient, therefore, increases with an approach of the equator. The change is not very great; a system compensated for Golden may be used without readjustment practically throughout the United States.

If the T.C. is expressed in gammas, changes in scale value should not affect it; however, there may be such an influence, if a change in the ε-screw changes the lateral position of the center of gravity. In the magnetic system investigated, the T.C. increases with scale value; the increase is small for high, great for low magnetic latitudes; yet, in both cases close to the observational error. The theory shows also that, if the T.C. is not determined near the reading 20, the deflection of the system enters, as it changes Z; however, the influence is small.

Computations of T.C. based upon the theory as outlined have been checked by the experiments with an accuracy of $\pm$ 0.3 γ and less.

The proposed experimental work required a number of preliminary investigations, such as the determination of the magnetic moment of the system and of its temperature coefficient, investigations into the most suitable procedures for changing temperatures, scale values, and latitudes. It was found that the simultaneous recording of the

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magnetic variations was required, which in turn necessitated a fairly constant temperature in the recording room. For the accurate determinations of temperature coefficients, arrangements had to be made to use always the same temperature gradient in order to obtain comparable values for different scale values and latitudes. The amount of lag of the reading behind the recorded temperature was accurately determined for the gradients employed.

Numerous temperature curves were recorded for normal conditions at Golden, for different latitudes varying between vertical intensities near the magnetic equator and intensities exceeding Z at the pole, and, finally, for different scale values.

The results are shown graphically, and are in close accord with the theoretical deductions. They show a decrease of the temperature coefficient with increase in latitude.

It is concluded that the new magnetic system gives reliable results for a great variety of latitude, scale value, and temperature conditions. The derivation of the complete theory makes it possible to determine accurately the influence of any changes in these factors upon the T.C., and to calculate the change in T.C. for any changes in the distribution of the masses of a magnetic system.--C. A. Heiland.

3. SEISMIC METHODS

(982) ON THE VELOCITY OF THE P-WAVE, WITH SPECIAL REFERENCE TO THE DISCONTINUITY RECENTLY SUGGESTED BY DR. H. JEFFREYS

By Hiroshi Kawasumi

Japanese Journal of Astronomy and Geophysics, Tokyo, vol. 9, No. 1, 1931, pp. 15-22.

The velocity of the P wave in the substratum up to the Wiechert discontinuity was re-estimated by assuming the Rudski-Wiechert formula $v = a - br^2$, using the mean travel times of 85 earthquakes recently obtained by H. Jeffreys. The depth of the Wiechert discontinuity was also determined. The results coincided within almost 1 per cent with the previous determination of the author from a near earthquake, and the general accuracy has increased. This good coincidence and the smallness of the residuals show that the velocity formula above determined is sufficient for the present so far as it concerns the accuracy of determining the travel time. The depth of the Wiechert discontinuity came out very near that of previous determination. Some light has been thrown on the smallness of the focal depth of large earthquakes of normal origins.--Author's abstract.

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(983) CHARACTERISTICS OF THE OSCILLOGRAPH GALVONOMETER: SOME PRACTICAL CONSIDERATIONS IN THE DESIGN AND APPLICATION OF THE OSCILLOGRAPH-GALVANOMETER VIBRATOR

By V. S. Thomander

Journal of the Franklin Institute, Philadelphia, vol. 213, No. 1, 1932, pp. 41-55.

The paper describes the mechanical characteristics of the vibrator for any periodic phenomena, so that the mechanical error due to the vibrator may be eliminated from the oscillogram and the true phenomena determined. The paper establishes the best damping to use, when considered from the standpoint of vibrator response, lag, and transient characteristics. There is a method given to determine the vibrator resonance and damping, that may easily be applied in the field. Curves, from which all the above-mentioned may be obtained, are supplied.--Author's abstract.

(984) A SIMPLE SUSPENDED MIRROR SEISMOGRAPH

By Benjamin Allen Wooten

Science, New York, vol. 75, No. 1932, 1932, pp. 82-83.

The apparatus consists essentially of a light mirror about 3 mm in diameter hung by means of two silk fibers in an F frame after the manner of Darwin. The motion of the mirror is traced on a photographic film, which is attached to a rotating drum in the usual manner.

The apparatus has been used thus far in the study of earth tremors and disturbances of a minor nature. It detects with ease the footsteps of a person 100 yards from the building. It records the passing of a street car or an automobile half a mile away. According to the author this apparatus is particularly well adapted to the study of tremors which do not penetrate the earth very deeply. It is light, simple, inexpensive, and easily portable; and it can be set up with a minimum of adjustment.--W. Ayvazoglou.

(985) A NEW VERTICAL SEISMOGRAPH

By Hugo Benioff

Bulletin of the Seismological Society of America, Stanford University, Calif., vol. 22, No. 2, 1932, pp. 155-169.

The vertical seismograph described in this paper makes use of a mechanical system of short period in combination with an electromechanical "transducer" of high sensitivity coupled to a recording galvanometer. (According to the footnote an electromechanical transducer is a device actuated by power from a mechanical system and supplying power to an electrical system, or vice versa.) In the Galitzin seismograph the transducer consists of a

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coil which moves in a magnetic field in such a manner as to generate electromotive force proportional to the velocity of the inertia reactor. The present transducer embodies a modification of the common telephone-receiver principle and is also of the velocity type.

The mechanical system of the seismograph is described and the theories of the electromechanical transducer and of the seismograph are given.--W. Ayvazoglou.

(986) REFLECTION METHOD IN SEISMIC PROSPECTING

By H. M. Rutherford.

The American Institute of Mining and Metallurgical Engineers, New York, Technical Publication 486, 1932, 22 pp.

The purpose of the present paper is to present the method of reflections in the mapping of geologic structure and also to give some indications of its limitations.

The problems connected with the reflection method are summarized by the author in part as:

1. General design of instruments.
2. Identification of the reflection on the seismogram.
3. The correlation of the reflection with the reflecting bed.
4. Methods of computation.

The relationship between the time-distance curve for refracted waves and that for reflected waves is developed. General formula for reflections is derived. A discussion is given on the (1) path of reflected ray in case of several beds, (2) the average velocity, (3) the surface (or weathering) correction, (4) reduction to mean datum, and (5) curved paths.

The last part of the article deals with the examples of reflections as shown in graphs and tables.

The author concludes:

> It is pertinent to point out that seismic methods of prospecting have not reached, and may never reach, a stage where the calculations are merely a matter of routine. Geological conditions are not the same all over the country. They vary considerably even in any one region. Methods that might give close approximations to true conditions in one territory may be found to give very great errors if used in another.
>
> In general, the results presented in this paper are the outgrowth of several years of experience in seismic prospecting. Much work remains to be done, both experimentally and in methods of interpretation of data.--W. Ayvazoglou.

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(987) POSSIBILITY OF FREE OSCILLATIONS OF STRATA EXCITED BY SEISMIC WAVES

By K. Sezawa and K. Kanai

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 273-298.

The present paper continues as a report of the authors' research work to determine the possible range of free oscillations of strata due to a seismic disturbance (see Geophys. Abs. 38, p. 477). This paper deals with a case where primary seismic waves are incident upwards normally to twofold stratified layers resting on the surface of a semi-infinite body.

Thicknesses, densities, and elastic constants of the two layers and of the bottom medium, obtained from the results of investigations made by Matuzawa and Imamura, and used by the authors for their mathematical discussion, are as follows:

Layer	Thickness	Density	V for P waves	V for S waves
Upper layer (granite)	H'-H = 20 km	ρ'' = 2.7	5.0 km/sec.	3.15 km/sec.
Second layer (basaltic)	H = 30 km	ρ' = 3.0	6.1 km/sec.	3.70 km/sec.
Bottom medium (ultrabasis)	∞	ρ = 3.5	7.5 km/sec.	4.45 km/sec.

A few numerical examples are shown in figures.--W. Ayvazoglou.

(988) AMPLITUDES OF P AND S WAVES AT DIFFERENT FOCAL DISTANCES

By K. Sezawa and K. Kanai

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 299-335.

This paper is concerned with P and S waves of equal periods generated from a point in a visco-elastic body and transmitted in all directions toward infinity. To determine the amplitudes of the waves in all probable cases, the authors considered the generation of the waves in a certain distribution in different azimuths as well as different latitudes.

From the results of their theoretical investigations, the authors conclude that, at any rate, the abnormal smallness of the amplitudes of P waves can not be ascertained directly from the nature of the wave propagation.--W. Ayvazoglou.

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(989) ON THE EXPRESSIONS OF THE DEFORMATION OF A SEMI-INFINITE ELASTIC BODY DUE TO THE TEMPERATURE VARIATION

By G. Nishimura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 335-351.

Nishimura's investigations presented in this article are closely connected with those published by him in the Bulletin of the Earthquake Research Institute, vol. 8, No. 2, 1930, pp. 91-143, under the title "The effect of temperature distribution on the deformation of a semi-infinite elastic body." (See Geophys. Abs. 17, p. 20.)

Nishimura studied the deformation of the solid due to temperature distribution and variation satisfying all the conditions of the theory of heat conduction.

The two following cases were examined: The case where the inertia of solid was neglected, and that where the inertia effect was taken into account. In both cases the resulting equations contained the term of density, in spite of the fact that the inertia term was neglected in one case and not in the other.--W. Ayvazoglou.

(990) INVESTIGATION ON THE DEFORMATION OF THE EARTH'S CRUST IN THE TANGO DISTRICT INCIDENT TO THE TANGO EARTHQUAKE OF 1927

By Chūji Tsuboi

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 411-435.

Previous investigations of the deformation of the earth's crust in the Tango district brought about by the Tango earthquake of 1927 have been made by the author (see Geophys. Abs. 18 and 34). In this article Tsuboi continues his investigation and discusses the results of the last precise levelings carried out by the Land Survey Department of the Imperial Army.--W. Ayvazoglou.

(991) INVESTIGATION OF THE DEFORMATION OF THE EARTH'S CRUST IN IDU PENINSULA CONNECTED WITH THE IDU EARTHQUAKE OF NOVEMBER 26, 1930

By Chūji Tsuboi

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 335-352.

In his previous paper (Bulletin, Earthquake Research Institute, Tokyo, vol. 9, 1931, p. 271) Tsuboi compares the old and new precise levelings made

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around the peninsula and discussed the results. In the present paper he discusses the differences between the old and new triangulation over the area. The movement of each triangulation point is established. The deformation of the earth's crust is investigated on the basis of the results.--W. Ayvazoglou.

(992) SEISMOMETRICAL REPORT

By N. Nasu and Ch. Yasuda

Bulletin of the Earthquake Research Institute, Tokyo, vol. 10, No. 2, 1932, pp. 492-498.

The report gives:

1. Sensible earthquakes in Tokyo for the period October 1 to December 31, 1931.

2. Important distant earthquakes as observed in Tokyo.

3. A map of distribution of the earthquakes that originated within a distance of 160 kilometers from Tokyo.

For previous report see Geophysical Abstracts 34.--W. Ayvazoglou.

(993) TWO-COMPONENT VIBROGRAPH

American Askania Corporation

Instruments, Pittsburgh, Pa., vol. 5, No. 1, 1932, p. 21.

A special feature of this instrument, designed for the study of mechanical vibrations, is that the vibrations are converted into visible wave forms by a mechanical optical arrangement, rather than by use of a cathode-ray oscillograph.

To determine the extent and direction of the vibrations, the movement of the ground is broken up into its three spatial components. The three pendulum weights in the instrument are therefore so arranged that they are affected only by forces acting in one of three directions at right angles to each other.--W. Ayvazoglou.

(994) TRI-DIMENSIONAL VIBROGRAPH

By the Vibration Specialty Co.

Instruments, Pittsburgh, Pa., vol. 5, No. 5, 1932, p. 136.

The vibrograph is a form of seismograph which indicates and records components of vibration simultaneously in a vertical and two horizontal

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directions. The instrument comprises a heavy cubic mass suspended in a frame by a system of springs, and means for indicating and recording relative motion between the mass and the frame. When placed upon any vibrating body the frame vibrates with the body while the mass due to its inertia tends to remain at rest.--W. Ayvazoglou.

(995) THE JAPANESE EARTHQUAKE OF MARCH 29, 1928, AND THE PROBLEM OF DEPTH OF FOCUS

By V. C. Stechschulte

Bulletin of the Seismological Society of America, Stanford University, California, vol. 22, No. 2, 1932, pp. 81-137.

A detailed investigation of the Japanese earthquake of March 29, 1928, to which Wadati, on the basis of the S-P intervals at the Japanese stations, had assigned great focal depth, has been made in order to see if the records at all distances show the expected effects of that depth.

1. The S-P, P, and S travel-time curves show systematic, graduated departures from the "average" curves.

2. These same curves have an inflection point in the vicinity of $\triangle = 10^{\circ}.5$.

3. The two pairs of singly reflected waves, pP and PR, sS and SR, were recognized, and tables of observed travel times for the pP and sS waves are here presented for the first time.

4. Tables of travel times for other phases, P^1, S_cS, S_cP_cS, $S_cP_cP_cS$, were drawn up and compared with the times given in the Macelwane tables.

The evidence drawn from the foregoing is all consistent in pointing to extraordinary depth of focus. To obtain a numerical evaluation of that depth, a new method was devised utilizing the travel-time curves for pP and P. The depth was thus calculated as 410 ± 30 kilometers. This same method also supplied means for deriving the time of occurrence and for improving the approximate location of the epicenter.

The coordinates of the epicenter are: 31° 45' N., 138° 12' E.

The time of occurrence was determined as 5^h 06^m 03^s G.M.T., March 29, 1928.

Further check on the focal depth of 410 milometers is afforded by the "reduced" travel times which have been calculated from the data of the present earthquake, and which are found to agree very satisfactorily with the times for shocks at or near the surface as given by various workers.

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An alphabetical list of the Japanese stations, together with the arrival times of P and the S-P intervals as given by Wadati (On shallow and deep earthquakes: Geophys. Mag., Tokyo, vols. 1 and 2, 1929), is presented. This is followed by a list of the other stations from which data were available. Bibliography is added.--Author's abstract.

(996) THE EARTHQUAKE IN SANTA MONICA BAY, CALIFORNIA, ON AUGUST 30, 1930

By B. Gutenberg, C. F. Richter, and H. O. Wood

Bulletin of the Seismological Society of American, Stanford University, California, vol. 22, No. 2, 1932, pp. 138-154.

The occurrence of a moderately strong local earthquake in Santa Monica Bay, Calif., on August 30, 1930, is discussed and its epicenter and origin-time determined as follows: $\varphi = 33^{\circ}\ 57'$ N., $\lambda = 118^{\circ}\ 38'$ W., $0 = 4 : 40 : 36.0$ p.m., P.S.T. ($0^{h}\ 40^{m}\ 36^{s}.0$, G.C.T., August 31, 1930).

The maximum intensity observed was VIII of the Modified Mercalli Intensity Scale of 1931, and the shock was perceptible at distances up to about 160 kilometers (100 miles) from the epicenter. The distribution of apparent intensity exhibits numerous irregularities which are discussed in the text.

The depth of origin can not be determined accuratoly, but the data are consistent with a depth of 10 to 15 kilometers (6 to 9 miles). A significantly greater depth is not consistent with the data.

The surface and subsurface geology of the region are discussed briefly.--Authors' abstract.

(997) TRENDS IN GEOPHYSICAL PROSPECTING WITH EXPLOSIVES

By Roland F. Beers

The Explosive Engineer, Wilmington, vol. 9, No. 8, 1931, pp. 288-289.

In selecting explosives for use in seismic prospecting, the author examines important characteristics such as strength, density, rate of detonation, water resistance, consistency, resistance to freezing, safety, and cost per unit of explosive energy.

The efficiency of personnel used in seismic prospecting is emphasized.--W. Ayvazoglou.

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4. ELECTRICAL METHODS

(998) GEOPHYSICAL PROSPECTING. NEW SCHLUMBERGER METHOD

By A. Montgomery

Industrial Australian and Mining Standard, Melbourne, vol. 87, No. 2231, 1932, p. 144.

In this article Montgomery discusses the new electrical method of examining ground passed through by boreholes, as described by C. and M. Schlumberger and E. Leonardon in Technical Publication 462 of the American Institute of Mining and Metallurgical Engineers (see Geophys. Abs. 35, p. 392).--W. Ayvazoglou.

(999) ELECTRICAL PROSPECTING IN CANADA

By J. J. Breusse

Engineering and Mining Journal, New York, vol. 133, No. 6, 1932, pp. 337-338.

The purpose of this paper is to illustrate, by two examples of practical surveys, the use of the self-potential method in ore exploration.

The author discusses briefly the conditions under which the phenomenon of spontaneous polarization occurs, and the reasons why it is one of the most reliable and rapid techniques in the explorations for ore.

The electrical surveys of the F orebody of the Amulet Mines, in the Rouyn district of Quebec, and of the Brunschwig orebody near Hope, B. C., were examined.

In both cases the electrical conclusions agreed satisfactorily with the geological information.--W. Ayvazoglou.

(1000) EARTH RESISTIVITY SURVEY IN ILLINOIS

By M. King Hubbert

Engineering and Mining Journal, New York, vol. 133, No. 3, 1932, pp. 142-143.

Three types of problems were investigated by the earth-resistivity methods specified: (1) Faults in Paleozoic sediments, (2) gravel deposits and ground-water supply in glacial drift, and (3) anticlines buried beneath drift.

Apparatus used was the megger ground tester.

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It was found that faults could be discovered, especially if the outcrops on the opposite side were different or if a considerable shear zone were associated with the fault plane. Major gravel deposits having fairly sharp boundaries could be detected readily because of their relatively higher specific resistivity. Moreover, the one buried anticline tested gave a pronounced anomaly, which coincided with the anticlinal axis as independently determined from well-log data. Attempts at precise depth determinations have not as yet been successful.--W. Ayvazoglou.

(1001) OBSERVATION AND DEDUCTION APPLICABLE TO MEASUREMENT OF ELECTRICAL RESISTIVITY OF LARGE VOLUMES OF EARTH IN PLACE

By Carl Henry Knaebel

Bulletin of the Michigan College of Mining and Technology, Houghton, vol. 5, No. 2, January, 1932, 31 pp.

In this paper Knaebel discusses and developes mathematically the solutions for some of the simpler problems involved in that type of electrical prospecting known as the "surface potential method." The number of such problems is of course great, and the author expresses the hope that the results for those treated in this thesis will be of interest to the engineer and that the methods of attack explained here will aid the student of geophysics in solving many of the more difficult problems.

The solution of problems of current distribution and current flow in infinite conductors can, according to the author, seldom be found in treatises on current electricity, which deal chiefly with electrical machines and circuits. Thus in the present work Knaebel found it necessary to resort to the study of similar problems in the theory of electrostatics and then to transfer the solutions bodily to the current-flow problems.

The headings of the article are as follows:

Distribution of current in an infinite homogeneous medium.
Distribution of potential in an infinite homogeneous medium.
Potential distribution in the case of two layers.
Interpretation of field data.--W. Ayvazoglou.

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(1002) GEOPHYSICAL PROSPECTING METHODS

Editorial note

The Miner, Vancouver, vol. 5, No. 7, 1932, pp. 213-214

This paper summarizes E. G. Leonardon's address on Schlumberger's methods of prospection, according to the following outline:

1. Exploration for conductive orebodies.
2. Stratigraphical and tectonical studies.
3. Dam site studies; mapping of buried valleys.
4. Measurements of resistivities in drill holes; electrical correlations.
5. Preliminary discussion of problems, examination of field data, test surveys.

The address was concluded by discussing the electrical measurement of resistivity and porosity inside of open drill holes by an insulated cable lowered in the hole to obtain the electrical characteristics of the rocks in situ.—W. Ayvazoglou.

5. RADIOACTIVE METHODS

(1003) ÜBER DEN LUFTDRUCKKOEFFICIENTEN DER HARTEN ULTRASTRAHLUNG

(ON THE AIR-PRESSURE COEFFICIENT OF HARD COSMIC RADIATION)

By W. Messerschmidt and W. S. Pforte

Zeitschrift für Physik, Berlin, vol. 73, No. 9/10, 1932, pp. 677-680.

The mean value of the air-pressure coefficient of hard cosmic radiation (protected from all sides by 10 cm thick lead plates) was found to be very constant during a period of measurements of half a year; the same was found for the intensity of radiation reduced to the height of the barometer equal to 750 mm Hg. During low barometric pressures of short duration, deviations from the mean air-pressure coefficient were observed.--Authors' abstract translated by W. Ayvazoglou.

(1004) COSMIC-RAY IONIZATION AND ELECTROSCOPE-CONSTANTS AS A FUNCTION OF PRESSURE

By Robert A. Millikan

The Physical Review, Minneapolis, vol. 39, No. 3, 1932, pp. 397-403.

1. The residual ionization in an electroscope at infinite depth in water, that is, its zero reading, is found to be an inverse function of the pressure. Thus, in a particular electroscope the zero at 1 atmosphere was 5.13 ions cm^3/sec., while at 30.1 it had fallen to 1.2 ions cm^3/sec.

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2. Also, when in this electroscope the pressure was changed from 1 atmosphere to 30.1 atmospheres the observed ionization current rose but 13.80-fold, which multiplying factor was found to be the same for gamma rays and for cosmic rays.

3. Both of these pressure effects are shown to be due to lack of saturation in high-pressure electroscopes, as first explained in Nature of October 3, 1931, by Bowen and the author.

4. From the multiplying factor found in (2) in the measured ionization at Pasadena in this 30-atmosphere, high-pressure electroscope, the number of cosmic-ray ions at 1 atmosphere (24° C., 74 cm pressure) in this electroscope at Pasadena is found to be fairly accurately 2.63 ions cm^3/sec.

5. The sea-level value of the ionization in this electroscope is 2.48 ions cm^3/sec.--Author's abstract.

6. GEOTHERMAL METHODS.

(1005) RECENT GEOTHERMAL MEASUREMENTS IN THE MICHIGAN COPPER DISTRICT

By James Fischer, L. R. Ingersoll, and Harry Vivian

The American Institute of Mining and Metallurgical Engineers, New York, Technical Publication No. 481, 1932, 11 pp.

Considerations of heat conduction guided the measurements made to determine the actual virgin temperatures at the "temperature stations." Holes in which were inserted one or more thermometers, were drilled a few inches back from the breast. Mercury-in-glass thermometers were chosen, mainly because of their simplicity and reliability. Two, and sometimes three, thermometers were inserted in these holes, and were read at 2-hour intervals until three or four readings had been taken. This proceeding was repeated over a number of days. It was found that reliable readings were obtained without waiting until some days after drilling and in spite of nearby blasting.

The conclusions drawn by the authors read as follows: Temperature measurements in eight special drill holes in the Calumet and Hecla mines, together with one in an old hole which has suffered no appreciable temperature change in 10 years, all fall very nearly on a straight line. The temperatures range from 74.75° F. at 3,562 feet below the surface to 95.31° at 5,679 feet. When taken in connection with Lane's value of 43° for the mean surface temperature, these give an average temperature gradient of 1° F. in 108.5 feet, or 1° C. in 59.5 meters, which is only about one-half the Kelvin average for the whole earth (1° in 27.76 meters). The gradient at an average depth of 4,500 feet is 1° F. in 103.1 feet.

The data are not sufficient as yet to allow any positive conclusions as to the time and extent of the glacial epochs, but point strongly to a value at least as large as 30,000 years as the time which has elapsed since the last epoch.--W. Ayvazoglou.

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(1006) MATHEMATICAL THEORY OF HEAT FLOW IN THE EARTH'S CRUST

By David Otto Ehrenburg

University of Colorado Bulletin, Boulder, vol. 32, No. 12, May, 1932.
The University of Colorado Studies, vol. 19, No. 3, 1932, pp. 327-355.

In the introduction to the mathematical discussion of the theory of heat flow in the earth's crust given in this article, the author refers to Ingersoll and Zobel's application to physical geology of the mathematical theory of heat conduction in homogeneous media, and calculation by them of a number of curves for the cooling of lavas and laccoliths. Ehrenburg continues:

> Unfortunately, their results are based on the narrowing assumption that the thermal constants of the cooling mass are identical with the constants of the underlying or surrounding rock. However, the shape of a cooling curve depends not only upon the configuration of the bodies between which the heat transfer occurs and their initial temperature difference, but also upon the relative values of conductivity, density, and specific heat. The writer believes that the difference in thermal constants is an important factor in modifying the character of a temperature curve; and in this paper is proposed a new method of treating the flow of heat in two heterogeneous solids in contact, and also is demonstrated its application to several particular cases similar to those treated by Ingersoll and Zobel.--W. Ayvazoglou.

(1007) TEMPERATURE OF ORE FORMATION

Editorial note

The Mining Magazine, London, vol. 47, No. 5, 1932, pp. 315-317.

This is an abstract of H. C. Boydell's article published in the Bulletin of the Institution of Mining and Metallurgy for April and May, 1932, Nos. 331 and 332, under the title, "Temperature of an epithermal ore deposit," the example investigated being the Camp Bird Mine at Silverton, Colo. (See Geophys. Abs. 40.)--W. Ayvazoglou.

(1008) RATE OF TEMPERATURE CHANGE

Editorial note

The Oil and Gas Journal, Tulsa, vol. 31, No. 3, 1932, p. 109.

In this article temperature gradients for a series of measurements are enumerated: In certain wells in Pennsylvania the temperature gradient indicated an increase of 1° F. for each 58 to 64 feet of depth, and in California an increase of 1° for each 52 feet is often observed. Other temperature investigations show that in some districts the temperature rises at an even faster rate, often at 1° for each 40 feet.

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In the Salt Creek field of Wyoming well temperatures at a depth of 100 feet ranged from 51.4 to 65.27° F., and at 2,000 feet they ran from 79° to 98.4°. Temperature measurements in a well in the Teapot Dome field, Wyoming, showed 71.6° at 1,000 feet and 125° at 2,867 feet. In another well in the same field the temperature at 25 feet was found to be 76°, but at 2,790 feet it was 124.5°. A completely dry well in the Teapot Dome field showed a temperature of 52° at 100 feet and of 101° at 2,000 feet. In wells in California the temperature at 4,000 feet varied between 150° and 170°. A thermometer run to the bottom of a well 4,500 feet deep in the Wellington-Fort Collins area of Colorado recorded 157°.. This was 3° higher than that registered by a well 7,900 feet deep near Kane, Pa.

Temperature measurements made by E. M. Hawtoff, of the Bureau of Economic Geology, in a well in the Big Lake field in Reagan County, Tex., showed the following temperatures at depths below 5,000 feet: At 5,700 feet, 122° F.; 6,500 feet, 135; 7,000 feet, 152; 8,000 feet, 161; 8,300 feet, 170.—W. Ayvazoglou.

7. UNCLASSIFIED METHODS

(1009) SCIENCE AND PRINCIPLES OF GEOPHYSICS

By C. A. Heiland

Engineering and Mining Journal, New York, vol. 133, No. 5, 1932, pp. 286-288.

In this article Heiland gives a review of Volumes I, II, and VI of B. Gutenberg's "Handbuch der Geophysik." Sections of the Handbuch der Geophysik appeared previously were reviewed by Heiland in the January, 1932, issue. Contents of the volumes were given in Geophysical Abstracts Nos. 12, 33, and 34.--W. Ayvazoglou.

(1010) SOME OBSERVATIONS OF THE BEHAVIOR OF EARTH CURRENTS AND THEIR CORRELATION WITH MAGNETIC DISTURBANCES AND RADIO TRANSMISSION

By Isabel S. Bemis

Proceedings of the Institute of Radio Engineers, New York, vol. 19, No. 11, 1931, pp. 1931-1947.

This paper presents correlations between the abnormal earth currents noted during magnetic storms and transoceanic radio transmission on both long and short waves. The radio transmission data were collected on the telephone circuits operating between New York and London and between New York and Buenos Aires. The earth-current data were collected on two Bell System lines extending approximately a hundred miles north and west from New York. The results of this work establish facts which have been known in a general way for some time.

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The direction of flow of abnormal earth currents in the neighborhood of New York seems to be along a northwest-southeast line. Coincident with such abnormal currents are periods of poor short-wave radio transmission. However, on long waves, daylight transmission over transatlantic distances is improved. On the short-wave circuit to Buenos Aires, transmission is adversely affected but only to a moderate extent.--Author's abstract.

(1011) THE OPERATING FREQUENCY OF REGENERATIVE OSCILLATORY SYSTEMS

By Hugo Benioff

Proceedings of the Institute of Radio Engineers, New York, vol. 19, No. 7, 1931, pp. 1274-1277.

The operative frequency of regenerative oscillatory systems is quantitatively derived in terms of the natural frequency, the damping constant, and the phase of the driving force. As an example the results are used to calculate the change in rate of a pendulum clock due to a given variation in the phase of the driving impulses. Applications to other types of systems are briefly indicated.--Author's abstract.

(1012) GEOPHYSICAL SURVEYS

Editorial note

Oil News, London, vol. 31, No. 1016, 1932, p. 435.

According to this note, the first geophysical surveys of Trinidad, carried out by the United British Oil-fields of Trinidad, yielded interesting results. Those obtained from Eötvös balance measurements made in the southwest corner of the island are still being worked out in Europe and will be available shortly.

Magnetometer and seismic surveys have been undertaken of the area between the Pitch Lake and Aripero, but the results, if anything, tend to give an unfavorable impression of oil prospects in the area. Both surveys indicate a large fault with a throw of 900 to 2,100 feet running to the south of the lagoon. In order to get readings from the harder or high velocity beds in the seismic survey, heavy shots of 1,000 pounds of dynamite had to be fired 3 to 4 kilometers out on both sides of the fault line.--W. Ayvazoglou.

(1013) LA GÉOPHYSIQUE APPLIQUÉE À LA PROSPECTION

(GEOPHYSICS APPLIED TO PROSPECTING)

Editorial note

Le Génie Civil, Paris, vol. 100, No. 4, 1932, p. 102.

The use of gravimetric, magnetic, seismic, and electrical methods of prospecting is mentioned briefly.--W. Ayvazoglou.

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(1014) LES METHODES SÉISMIQUES ET GRAVIMÉTRIQUE DE PROSPECTION DU SOUS-SOL

(SEISMIC AND GRAVIMETRICAL METHODS OF SUBSOIL PROSPECTING)

Editorial note

Le Génie Civil, Paris, vol. 100, No. 16, 1932, p. 405.

Brief summaries are given of articles published in the Annales de Mines, vol. 20, No. 10, 1931, by A. Maillet and J. Bazerque, and in vol. 20, No. 11, 1931, by M. H. Galbrun. Abstracts of these articles were published in Geophysical Abstracts No. 35, p. 387, and No. 37, p. 441, respectively.--W. Ayvazoglou.

(1015) USE OF GEOPHYSICS IN PROSPECTING FOR OIL AND GAS POSSIBILITIES NOT MYSTERIOUS

By K. C. Heald

The Oil and Gas Journal, Tulsa, vol. 31, No. 4, 1932, pp. 41-43.

The author says that although there is much that is difficult to learn, and a great deal that remains to be learned about geophysical methods, there is nothing mysterious. Of course, a clear understanding of the fundamental rules is necessary for the application of geophysics.

Explanations of some principles of geophysics, especially concerning oil prospecting, are given under the following headings:

Anticlinal theory. The theory developed now is that oil and gas tend to move through porous formations from regions of higher toward regions of lower pressure, and where this movement is arrested oil and gas pools form.

Search for structure. There are three primary requisites for an oil pool: (1) Favorable structure, including lenticular sand and fissured limestone conditions that lead to oil accumulation, (2) a suitable reservoir rock of "pay," and (3) an adequate source for the oil. It is to this search for structure that geophysical methods of prospecting are applied. The method most widely used is the gravimetric and the instrument is the torsion balance.

Pull of gravity. The torsion balance will reflect changes in structure of the rocks, and will accurately reflect such phenomena as anticlines, synclines, and large faults. However, many factors render the interpretation of torsion-balance data into terms of oil-field structure difficult and, at times, impossible. Every hill, every heavy bowlder close beneath the surface, will interfere with the recognition of the effects due to structure.

Different pulls. There are areas where the geologic structure is so complex that in spite of the existence of beds strongly contrasting in mass, the instrument is affected by so many pulls from different directions that it has proved impossible to convert the instrumental records into a reasonable

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geological picture. Thus the conclusion is drawn that the torsion balance will work most effectively in areas where the surface is flat, where there are no hidden "pockets" of either light or heavy material hidden close below the surface, where there are certain units among the formations within drilling depth that are appreciably heavier than those overlying them, and where structural conditions are comparatively simple. The torsion balance is totally unsuitable for work in areas where the surface is cut into high ridges and deep valleys, where the rocks at a depth of 1,000 feet or more are closely folded or complexly broken by faults, or where the rocks down to the limits of drilling depth furnish no appreciable contrast in the mass of individual units of formations.

Cost considered. Exclusive of the original cost of the equipment a torsion-balance party with two balances should be operated for approximately $3,000 a month. During that time they should make approximately 120 determinations of gravity. The territory they will cover, and therefore the cost per acre, will depend upon the detail which is essential in view of the expected geological conditions. According to data obtained from the Mid-Continent area a party can cover about 60 square miles at a cost of between 8 and 9 cents per acre. Very detailed examination may increase the cost to about 30 cents per acre.

Seismic methods. Physical principles of seismic methods are given briefly, and their subdivision into "refraction" and "reflection" methods is explained.

Search for salt domes. The refraction method has been particularly effective in discovering salt domes which lie less than 5,000 feet below the surface. The refraction seismograph is particularly suitable to explore territory where there are neither very elastic beds, such as heavy limestone, nor incoherent beds; where the formations down to a depth of at least several hundred feet are soft shales and sandstones with a highly elastic bed, and where the geologic structure is relatively simple. It is not recommended for work in areas where rocks are sharply folded, with individual beds inclining more than 30° from the horizontal, or where there are closely spaced faults.

Refraction seismograph cost. Exclusive of the original cost of the equipment an effective refraction seismograph party will call for an expenditure of from $16,000 to $22,000 per month. In that time they should explode about 150 charges of dynamite for depth determinations. The cost per acre varies greatly. Reconnaissance surveys for the discovery of salt domes have been made for as little as 4 cents an acre, while detailed surveys under difficult conditions may cost more than $5 an acre.

Reflection method. This method has been proved effective in some areas where refraction work is unsatisfactory, either because of excessive cost or because of geological conditions.

Computing vibration speed. If the seismograph operator knows that a certain per cent of the rocks down to a depth of, say, 6,000 feet is shale,

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another per cent is heavy beds of limestone, and the remainder are sandstones, the geophysicist will compute a reasonable speed, based upon experience in other areas and upon the known average velocities of seismic waves in shales, limestones, and sandstones.

Most favorable conditions. Favorable conditions, as well as those which are unfavorable for application of geophysical methods, are discussed.

Reflection seismograph cost. The over-all cost per troop ranges from $8,000 to $12,000 per month. An average of 4 to 8 depth determinations can be made per day, depending upon the conditions under which the work is done and the precision attempted. Under conditions such as exist in the Mid-Continent region, the cost per acre will range from as much as 90 cents to as little as 5 cents.

Magnetic method of geophysical prospecting is mentioned, but although unquestionably more territory in the United States has been covered by the magnetic than by any other geophysical method, it has fewer oil-field discoveries to its credit than has either the gravimetric or the seismic work. Besides, the difficulty of interpretation makes this method less applicable than the two other methods.

Cost considered. For a cost of not more than $400 it should be possible to cover approximately 200,000 acres a month by magnetic methods commonly used, making the cost of this examination approximately $0.002 per acre.

In conclusion, the author notes that none of the methods mentioned attempt to discover oil or gas directly. Their entire purpose is to secure geological information.--W. Ayvazoglou.

(1016) GEOPHYSICAL METHODS LOCATE METEORITE

By J. J. Jakosky

Engineering and Mining Journal, New York, vol. 133, No. 7, 1932, pp. 392-393.

Results of geophysical investigations of the Meteor Crater were given in a previous article, Geophysical Examination of Meteor Crater (see Geophys. Abs. 25, p. 127).

From these results exploration was recommended in five locations. According to the present article two of these holes have been completed, both of them definitely checking the indications of the geophysical survey as regards the occurrence, location, and depth of the meteoric material, as well as the depth to water and other structural effects.--W. Ayvazoglou.

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8. GEOLOGY

(1017) GEOLOGIC INTERPRETATIONS FROM ROTARY WELL CUTTINGS

By Robert M. Whiteside

Bulletin of the American Association of Petroleum Geologists, vol. 16, No. 7, 1932, pp. 653-674.

The paper includes the history, improvement, and possibilities of geologic interpretation of strata in the Mid-Continent area from rotary-drill cuttings by the use of microscopy. The field technique with its certain advances in obtaining drill cuttings forms Part I. The laboratory technique of preparation, examination, and correlation of rotary-drill cuttings forms Part II.--Author's abstract.

(1018) BOGGY CREEK SALT DOME, ANDERSON AND CHEROKEE COUNTIES, TEXAS

By H. J. McLellan, E. A. Wendlandt, and E. A. Murchison

Bulletin of the American Association of Petroleum Geologists, Tulsa, vol. 16, No. 6, 1932, pp. 584-600.

Boggy Creek salt dome is located near the axis of the east Texas geosyncline in Anderson and Cherokee Counties. It is of interest principally because it is the only interior salt dome in east Texas or Louisiana on which an oil field has been developed. Surface geology first attracted attention to this area, and exploration was carried on later by core tests and geophysical work.

This dome has many of the physiographic and structural features characteristic of other interior domes, but is unusual in shape, size, and other respects. A structurally low central area is found on top of the dome. Faulting is present near the south end of the uplift.

The salt movement probably occurred contemporaneously with that of other east Texas domes, being most pronounced between middle Wilcox and Carrizo times. In the central and northern portions of the dome, salt movement also occurred after the deposition of the Lower Claiborne beds.

Oil and gas is produced from the Woodbone formation in a long, narrow area on the southeast flank of the dome. The oil-producing area contains about 200 acres and the gas area about 50 acres. Present average daily production is about 1,000 barrels. Ultimate recovery from this field is not expected to exceed 4,000,000 barrels.--Authors' abstract.

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(1019) FAULTS IN COMODORO RIVADAVIA OIL FIELD, ARGENTINA

By Enrico Fossa-Mancini

Bulletin of the American Association of Petroleum Geologists, Tulsa, vol. 16, No. 6, 1932, pp. 556-577.

This article is a summary of the material published on the structural conditions of the Comodoro Rivadavia oil field by the Bureau of Mines and the oil administration of the Department of Agriculture of the Argentine Republic. The formations are much faulted, with resulting complications in structure. Other difficulties are irregular bedding, pinching sand bodies, and variable cementation. It is difficult in this area to map underground structure from surface indications.--Author's abstract.

(1020) ON THE MECHANICS OF MOUNTAINS

By Harold Jeffreys

Geological Magazine, London, vol. 68, No. 808, 1931, pp. 435-442.

It appears that the geophysical approach to the problems of crustal dynamics leads to a theory of mountain formation that covers the main features of the formation of nappes and is in general agreement with other geological evidence. The chief novelty is in the recognition of the importance of the spreading under their own weight of the rocks uplifted as a result of crustal shortening.--Author's abstract.

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9. NEW BOOKS

(1021) Johannsen, Albert. A descriptive petrography of the igneous rocks. Vol. 1, University of Chicago Press, 1931, 267 pp., 145 figs. Price $4.50. Introduction, textures, classification, glossary.

(1022) National Oil Scouts Association of America (Inc.). Year Book, 1932. May, 1932, 273 pp., 12 maps, statistical tables. Price $5.00. Obtainable through J. W. Selby, Shell Petroleum Corporation, Dallas, Texas. This yearbook is a compendium of the oil, gas, sulphur, and potash operations and the development of the south and southwest.

(1023) National Research Council. Transactions of the American Geophysical Union, Thirteenth annual meeting, April 28 and 29, 1932, Washington, D. C. National Academy of Sciences, Washington, D. C., June, 1932, 401 pp. The reports and papers presented at this meeting are given according to the sections into which the Union is divided. The contents of the book are as follows:

General assembly (pp. 5-49). - (1) Resolutions adopted: On the urgent need of continuing oceanographic work without material curtailment; on gravity work at sea by the United States Navy; regarding the purchase of apparatus for determining gravity at sea; on Naval Observatory time-signals; on the need of nongovernmental research institutions in meteorology; in commendation of Geophysical Abstracts, published as an information circular of the U. S. Bureau of Mines; on the Second International Polar Year, 1932-33; on the death of Alfred Judson Henry; on the depth of Robert DeCourcy Ward; on the death of Louis Bauer. (2) symposium on the application of geophysics to ocean basins and margins: Introduction, by Richard M. Field; Problems of island-arcs and ocean deeps, by Walter H. Bucher; The structure of the Bartlett Trough, by Stephan Taber; Seismic zones as related to relif of ocean-bottom, by N. H. Heck; Interpretation of gravity-anomalies and sounding-profiles obtained in the West Indies by the international expedition to the West Indies in 1932, by Harry Hammond Hess; Sounding the depths of the ocean for mapping the conformation and topography of the bottom, by G. W. Littlehales; The applications of seismic methods to submarine geology, by E. DeGolyer; Torsion-balance surveys in southwest Louisiana and southeast Texas, by D. C. Barton; Experiences of a seismologist with "seismic methods," by A. L. Day; Discussion following symposium.

Section of Geodesy (pp. 51-88). - (1) Progress report on the absolute determination of gravity at Washington, by Paul R. Heyl; (2) Improvements in the gravity apparatus of the United States Coast and Geodetic Survey, by E. J. Brown; (3) Gravity observations in the Bahamas, by J. P. Lustene; (4) Isostasy and related subjects, by F. A. Vening Meinesz; (5) Progress-report on radio dissemination of the national primary standard of frequency, by J. H. Dellinger; (6) Geodetic control for the plotting of the aerial photographs of the Belcher Islands, by Noel J. Ogilvie; (7) Analytical methods in aerial photogrammetry,

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by Earl Church; (8) New comparisons of the invar wires of Mexico, by Manuel Medina; (9) Progress report on investigation of invar tapes and precision circles, by L. V. Judson; (10) Geodetic work accomplished from May 1, 1931, to April 30, 1932, by William Bowie; (11) Further studies on the lunar correlations with small changes in the variation of latitude, by Harlan T. Stetson.

Section of seismology (pp. 89-110). - Symposium on the application of seismology to the study of ocean-basins: (1) Seismology and the ocean-basins, by N. H. Heck; (2) Accuracy of epicenter determinations, by Frank Neumann; (3) Applications of interferometric tiltmeters in the problems of geophysics, by George E. Merritt; (4) Seismology and structural geology, by W. T. Thom, jr.; (5) Earthquakes in the north Atlantic as related to submarine cables, by V. P. de Smitt.

Section of Meteorology (pp. 111-142). - (1) Weather Bureau program for the Second International Polar Year, by W. R. Gregg; (2) The use of polar year data in the study of atmospheric interchange, by W. J. Humphreys; (3) A program for the observation of weather changes during the total solar eclipse of August 31, 1932, by S. P. Fergusson and Charles F. Brooks; (4) Determination of atmospheric turbidity, by Herbert H. Kimball; (5) On winds in the upper atmosphere, by E. O. Hulburt; (6) Winds of the Antarctic, by W. C. Haines; (7) a study of the interrelation between air-temperatures in California and ocean temperatures in the northeast Pacific and its influence on long-range forecasting, by A. F. Gorton; (8) Notes on the exchange of energy between ocean and atmosphere, by W. F. McDonald; (9) Weather-charts for the northern hemisphere, by E. B. Calvert; (10) Fifty years of North American rainfall, by Oliver F. Fassig; (11) Atmospheric water-vapor, by Frederick E. Fowle.

Section of Terrestrial magnetism and electricity (pp. 143-191). - (A) Reports on magnetic and electric work of organizations in the United States during 1931-32: (1) Summary of reports received, by Harlan W. Fisk; (2) Auroral station at the Alaska Agricultural College and School of Mines, by Veryl R. Fuller; (3) Work of the Bell System relating to terrestrial magnetism and electricity during 1931, by Otto B. Blackwell; (4) Magnetic investigations of the Carnegie Institution of Washington, May 1931 to April 1932, by J. A. Fleming; (5) Researches at Mount Wilson Observatory of the Carnegie Institution of Washington relating to terrestrial magnetism, by Seth B. Nicholson; (6) Colorado School of Mines, by C. A. Heiland; (7) Massachusetts Institute of Technology: (a) Cooperation in the cosmic-ray survey, by Ralph D. Bennett; (b) The elimination of night-course variations in radio range-beacons, by N. G. Kear; (c) Developments in geophysical prospecting by electrical-potential methods, by W. Spencer Hutchinson. (8) Solar-constant work by the Smithsonian Institution, by C. G. Abbot; (9) Research in atmospheric electricity at the Stanford University, by Joseph G. Brown; (10) Geophysical work at the United States Bureau of Mines, by Scott Turner; (11) Magnetic work of the U. S. Coast and Geodetic Survey, by R. S.

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Patton; (12) Work of the U. S. Hydrographic Office in terrestrial magnetism and electricity, by W. R. Gherardi; (13) Work related to terrestrial magnetism and electricity of the Naval Research Laboratory, by E. D. Almy; (14) United States Signal Corps, by G. E. Kumpe. (B) Papers: (1) On calculations of the ionization in the upper atmosphere, by E. O. Hulburt; (2) The geophysical significance of radio measurements of the ionized layer, by M. A. Tuve; (3) radio exploration of ionization of the upper atmosphere, by J. H. Dellinger; (4) Kennelly-Heaviside-layer measurements on the Byrd Antarctic Expedition, 1929-30, by Malcolm P. Hanson; (5) Some common periodicities in radio transmission-phenomena, by G. W. Kenrick and G. W. Pickard; (6) Progress in the studies of cosmic correlations with radio reception at the Perkins Observatory, by Harlan T. Stetson; (7) Slow-moving ions in the atmosphere, by G. R. Wait and O. W. Torreson; (8) Principles of a new portable electrometer, by Ross Gun; (9) Optically compensated variometers and wide-range recorders to be used during the Jubilee Polar Year, by E. F. Johnston; (10) The relation of lightning discharges to changes in the electrical field of thunder storms, by J. C. Jensen.

Section of oceanography (pp. 193-263). - (1) Progress in the Woods Hole Oceanographic Institution and cruises of the Atlantic, by H. B. Bigelow and C. Iselin; (2) Oceanographic work at the Scripps Institution of Oceanography, University of California, La Jolla, California, July 1, 193?, to April 18, 1931, by T. Wayland Vaughan; (3) Contributions of the United States Hydrographic Office to oceanography, by A. B. McManus; (4) Oceanographic work of the Coast and Geodetic Survey during the past year, by Frank S. Borden; (5) On the penetration of daylight into the sea, by E. A. Hulburt; (6) Photo-electric measurements of the penetration of light in sea water, and the results of laboratory photo-electric measurements of the absorption-coefficient of sea water, by Burt Richardson; (7) Landslide modification of submarine valleys, by Francis P. Shepard; (8) Microbiology of the marine limestones, by Richard M. Field; (9) Radium content of ocean-bottom sediments, by C. S. Piggot; (10) Temperature gradients in ocean waters, by E. B. Stephenson; (11) Progress in the investigation of surface temperatures of the western north Atlantic, by Phil E. Church; (12) The recommendation of a program of hydrographical observations leading to the quantitative determination of Arctic and Atlantic interchanges, by E. H. Smith; (13) Oceanographic work of the United States Coast Guard during 1931 and plans for 1932, by N. G. Ricketts; (14) A recent tour of some oceanographic centers of northwest Europe, by Charles F. Brooks; (15) Sea temperatures by bucket on express liners, by Charles F. Brooks.

Section of volcanology (pp. 265-273). - (1) Central American volcanoes in 1932, by E. G. Zies; (2) The volatility of silica with steam, by George W. Morey; (3) Volcanologic developments in 1931-32, by T. A. Jaggar.

Section of hydrology (pp. 275-401). - (A) Annual reports of permanent committees for 1931-32. (B) Papers: (1) Recent investigations of Thiem's method for determining permeability of water-bearing materials, by L. K. Wenzel; (2) Equation for lines of flow in vicinity of discharging

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artesian well, by Charles V. Theis; (3) Characteristics of run-off of southeastern Alaska, by Fred F. Henshaw; (4) Certain flood-flow phenomena of Iowa rivers, by Floyd A. Nagler; (5) Forces acting on soil moisture in relation to other fundamental functions, by N. E. Edlefsen; (6) The disposal of moisture from the aerated portion of soils, by F. J. Veihmeyer; (7) The relation of hydrographs of run-off to size and character of drainage-basins, by LeRoy K. Sherman; (8) Velocity of flow in natural streams, by H. K. Barrows; (9) Drainage-basin characteristics, by Robert E. Horton; (10) The 1929 floods on eastern North Carolina streams, by Thorndike Saville; (11) Investigations of the fluctuations of water levels in observation wells in Virginia, by R. C. Cady; (12) Investigations of the fluctuations of the ground-water table in Pennsylvania, by S. W. Lohman; (13) Hydraulic and sedimentary characteristics of rivers, by L. G. Straub; (14) New thoughts on river regulation, by Gerard H. Matthes; (15) Model research in the river hydraulic laboratory of the Massachusetts Institute of Technology, by J. B. Drisko; (16) Present status of the National Hydraulic Laboratory, by K. Hilding Berg; (17) New formulae for predicting annual runoff of some California watersheds, by A. F. Gorton; (18) Rainfall and run-off characteristics of the Delaware River Basin, by Clarence S. Jarvis; (19) Checks on the model law for hydraulic structures, by Morrough P. O'Brien; (20) A method for computing the amount of evaporation of sea water from a tank by changes in salinity, with experimental results obtained on board the SCRIPPS, August 13-24, 1928, by Burt Richardson; (21) Problems of underground water flow in the oil industry, by Morris Muskat.

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